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ABSTRACT

A study investigated the factors influencing the English word identification performance of Spanish-speaking beginning readers. Thirty-two Spanish-speaking students (in kindergarten and first grade) from two urban schools who were identified as beginning, nonfluent readers were administered tests of letter naming, Spanish phonemic awareness, Spanish and English word recognition, and Spanish and English oral proficiency. Multiple regression analyses revealed that the readers' performance on English word and pseudoword recognition tests was predicted by the levels of both Spanish phonemic awareness and Spanish word recognition, thus indicating cross-language transfer. In contrast, neither English nor Spanish oral proficiency affected word identification performance. Results suggest a specific way in which first language learning and experience can aid children in the beginning stages of reading. (Four tables of data are included; 70 references and an appendix of words in the matching test are attached.) (Author/PRA)

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# CENTER FOR THE STUDY OF READING

Technical Report No. 541

## CROSS-LANGUAGE TRANSFER OF PHONEMIC AWARENESS

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## Abstract

A study investigated the factors influencing the English word identification performance of Spanish-speaking beginning readers. Beginning readers were administered tests of letter naming, Spanish phonemic awareness, Spanish and English word recognition, and Spanish and English oral proficiency. Multiple regression analyses revealed that the readers' performance on English word and pseudoword recognition tests was predicted by the levels of both Spanish phonemic awareness and Spanish word recognition, thus indicating cross-language transfer. In contrast, neither English nor Spanish oral proficiency affected word identification performance. Results suggest a specific way in which first-language learning and experience can aid children in the beginning stages of reading.

## CROSS-LANGUAGE TRANSFER OF PHONEMIC AWARENESS

The number of students from linguistically diverse backgrounds who are enrolled in U.S. schools is increasing rapidly (Hakuta & E. E. García, 1989). For these students, learning to read in English is one of the crucial components of academic success. Hence how these students' first-language knowledge may affect their reading in a second language is of great pedagogical importance. In addition, the effects of first language on second-language reading, that is, cross-language transfer, is also of theoretical interest as evidenced by the current research in this issue. After two decades of little attention to cross-linguistic transfer, researchers in the area of second-language acquisition have returned to studying acquisition and production of second-language structures as a function of the characteristics of the first language (for reviews see Gass & Selinker, 1983; Kellerman & Sharwood Smith, 1986; Odlin, 1989). However, there has been very little systematic research on the role of first-language cognitive strategies and knowledge on *reading* in a second language (for exceptions see Faltis, 1986; Kendall, Lajeunesse, Chmilar, Shapson, & Shapson, 1987; Koda, 1987). If some of the skills and knowledge second-language readers have in their first language can transfer, then it may facilitate reading in the second-language. Thus, educators may be able to build upon the skills and knowledge that students from linguistically diverse backgrounds bring from their first language to a second-language reading situation (cf. Vygotsky, 1962). To achieve this goal, the nature and foci of cross-language transfer effects that facilitate second-language reading need to be determined.

The primary purpose of the study reported here is to investigate cross-language transfer in bilingual students during the early stages of learning to read. However, to have cross-language transfer studies that are more than mere descriptions, there are two points to consider: First, the transfer issue needs to be couched within a well-supported model describing cognitive processes in reading, and second, both the components of the reading process that are investigated for possible transfer and the tasks that are used to tap these components should be well specified, since the type of task that is used to tap a bilingual's memory or reading comprehension affects the outcome (Durgunoğlu & Roediger, 1987; G. E. García, 1991).

In the last 20 years, there has been tremendous progress in describing the cognitive processes of reading and of reading acquisition (for reviews see Adams, 1990; Perfetti, 1985; Rayner & Pollatsek, 1989; Seidenberg & McClelland, 1989; Stanovich, 1986). One theme that has emerged from this research is the important role efficient recognition of individual words plays in skilled reading. Especially in beginning readers, reading comprehension has been found to be primarily influenced by word-level skills (Calfee & Piontowski, 1981; Juel, Griffith, & Gough, 1986; Shanahan, 1984; Stanovich, 1982; Tunmer, Herriman, & Nesdale, 1988; Tunmer & Nesdale, 1985).

Recent research has also given us important insight into the sources of word recognition skills. For monolinguals, one of the best predictors of learning to read and spell in an alphabetic system is being aware of phonemes, those speech sounds smaller than syllables and corresponding to letters or letter clusters. Beginning readers who are aware of the discrete segments of speech are more likely to learn to map the spelling patterns to their corresponding phonemes (Juel et al., 1986; Liberman, 1987; Lomax & McGee, 1987; Mason & Allen, 1986; Treiman & Baron, 1983). Many studies have demonstrated the strong correlations between phonemic awareness tests--such as invented spelling, segmenting, blending, rhyming--and word recognition (Calfee, Lindamood & Lindamood, 1973; Fox & Routh, 1984; Mann, Tobin, & Wilson, 1987; Perfetti, Beck, Bell, & Hughes, 1987; Stuart & Coltheart, 1988; Treiman & Baron, 1983; Tunmer et al., 1988; Yopp, 1988; Zifcak, 1981; for reviews see Wagner, 1988; Wagner & Torgeson, 1987). In fact, phonemic awareness has been shown to be a stronger predictor of reading

achievement than global measures such as intelligence or reading readiness (Juel et al., 1986; Stanovich, Cunningham, & Cramer, 1984; Tunmer & Nesdale, 1985; Vellutino & Scanlon, 1987).

There is clearly a bidirectional influence between schooling and phonemic awareness. Just as phonemic awareness leads to rapid reading acquisition, schooling and experience with reading an alphabetic language seems to develop phonemic awareness further (Ehri & Wilce, 1980; Goswami & Bryant, 1990; Morais, Cary, Alegria, & Bertelson, 1979; Read, Yun-Fei, Hong-Yin, & Bao-Qing, 1986; Stuart & Coltheart, 1988). The existence of a causal link from phonemic awareness to reading achievement has been demonstrated by longitudinal training studies. In these studies, training aimed at developing phonemic awareness has accelerated the pace of reading acquisition (Blachman, 1987; Bradley & Bryant, 1985; Lundberg, Frost, & Petersen, 1988; Williams, 1980). In sum, research with monolingual readers convincingly identifies phonemic awareness as one of the crucial components of word recognition and through it, beginning reading achievement. Monolingual research also indicates that experience with language through rhymes and word games is instrumental in developing this awareness (Maclean, Bryant, & Bradley, 1987).

The question of interest in our study is whether phonemic awareness that develops through experience at home and school in a child's first language (i.e., Spanish) is related to word recognition in another language (i.e., English). Although the relationship between phonemic awareness and reading acquisition has been well-established with monolingual readers of different languages (e.g., Chinese, Swedish, Danish, and Spanish, as well as English), as far as we know, there has been no research on cross-language effects of phonemic awareness. In our study, we have examined the relationship of Spanish phonemic awareness to English word recognition tasks to determine if there is cross-language transfer in the word recognition component of reading.

A related issue we have addressed is the role of oral language proficiency in second-language word recognition. Current second-language reading pedagogy appears to assume a model of word recognition in which skilled readers rely on semantic and possibly syntactic cues as much as or more than graphic cues to predict the upcoming words in a text (see for example, Carrell & Eisterhold, 1983; Devine, 1987). In this model, good readers are thought to sample the visual information in text to confirm their hypotheses, rather than thoroughly processing the graphic input. Because forming and testing hypotheses plays such an important role in these models, language proficiency (and its usual operationalization, oral language proficiency) gains prominence because language proficiency enables a reader to form hypotheses.

However, first-language reading research does not support such a top-down model of the skilled monolingual reader. Evidence from a wide variety of studies shows that skilled readers do not use contextual constraints to reduce the visual processing involved in reading (see Adams, 1990; Durgunoğlu, 1988; Juel, 1980; McConkie & Zola, 1981; Perfetti, 1985; Rayner & Pollatsek, 1989; Stanovich, 1986; Stanovich & West, 1983). In fact, good readers rely on semantic context for word recognition only if orthographic processing is slowed down, for example, because the word is unfamiliar or it is degraded.

It should be noted that skilled readers *do* make effective use of semantic and syntactic cues in comprehending text. At issue here is not whether they use such cues, but the role such cues have in word recognition. Recent first-language reading research has demonstrated clearly that skilled readers' advantage in word recognition is due to their superior processing of graphic information, and does not involve greater reliance on contextual clues. Good readers' efficient processing of graphic information in turn enables them to focus on semantic cues and background knowledge to help in integrating what is read. As yet, second-language reading research does not reflect the influence of recent first-language reading research that demonstrates the primacy of bottom-up word recognition processes in skilled



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readers and the detrimental effects of deficient lower level processing on the efficiency of higher level processing and comprehension (Haynes & Carr, 1990).

Recent studies with monolinguals also show a limited effect of oral language variables on word recognition measures. For example, Juel and her colleagues (1986) found that word recognition proficiency makes a highly significant unique contribution to reading comprehension even after the contribution of listening comprehension is considered. Dickinson and Snow (1987) found that oral language measures such as narrativity and communicative adequacy had no significant correlations with prereading variables such as phonemic awareness, print production and decoding. In contrast, more decontextualized oral skills (such as quality of formal definitions) were correlated with the prereading variables (see also Cummins, 1981; Heath, 1986; Wells, 1987, for a similar point on how not all oral language skills are equally helpful in school settings). Parallelling this view is that of researchers who have cautioned against using second-language oral language proficiency to predict reading comprehension of bilingual students. As Moll and Diaz (1985) point out, "It is clear from our results how easy it is to underassess the Spanish dominant student's reading abilities in English. The source of difficulty, in our opinion, derives from the teacher's use of the students' *English-oral-language* proficiency assessment to make placement decisions" (p. 147, italics theirs). The changing models of word recognition (for a review see Stanovich, 1991), and the new data on the varied relationship between oral language and reading necessitate looking anew at the effects of second-language proficiency on second-language reading tasks. Hence, the second goal of the present study was to determine the contribution of oral language proficiency to performance on English word recognition tasks. To address this issue, we have determined the oral proficiency levels (listening comprehension, vocabulary, language production) of our subjects in both English and Spanish and have investigated their effects on English word recognition.

To summarize, our primary goal was to study the variables that affect English word recognition of Spanish dominant bilingual beginning readers. By including Spanish phonemic awareness tests as well as both Spanish and English oral proficiency tests, we wanted to address the issue of cross-language transfer and the role of second-language proficiency on word recognition in a second language.

## Method

### Subjects

Subjects were 32 Spanish-speaking students from two urban schools identified by their teachers as beginning, nonfluent readers. Four subjects were dropped from the analyses because their data were incomplete[1]. Of the 28 students included in the analyses (13 females and 15 males), 23 were first graders and 5 were kindergarteners. The mean age of the 28 subjects was 84 months (*sd* = 5.4 months) at the time of testing. All testing was done in March and April.

The two schools were both in the same district and had predominantly Hispanic and low-income students. In both schools, 90-95% of the students were eligible for free or reduced lunch. All subjects were in transitional bilingual education programs because they were considered to have limited English listening and speaking proficiency as determined by State Board of Education guidelines. The goal of the bilingual education programs was to transition the children to all-English classrooms by the end of the second or third grade. In the first grade, students were mainly instructed in Spanish, with English taught as a second language. In both English and Spanish reading classes, basals were used and the students were grouped according to their reading proficiency levels. In kindergarten, mostly Spanish was used and the emphasis was on developing oral proficiency both in Spanish and in English.

## Tasks and Procedure

All tests were individually administered to the subjects by experimenters fluent in both Spanish and English. Each child was tested on two occasions separated by an interval of one or two weeks. During the first testing session, the experimenters gave instructions in Spanish and gave all of the Spanish tests and an English word recognition test. The order of testing was as follows: Letter naming, Spanish word recognition, English word recognition, Spanish phonemic awareness tests, Spanish oral proficiency test. The whole session lasted about one hour with short breaks between tests. During the second testing session, the experimenters gave instructions in English, but translated them to Spanish if necessary and English oral proficiency and transfer tests were given. The order of testing was as follows: English-like pseudoword training and reading, English word reading, English oral proficiency test. The second session lasted about 45 minutes with short breaks between tests.

**Letter identification.** Clay's (1979) letter identification test was used to determine the number of letters the children could correctly identify. The test consisted of 26 uppercase and 28 lowercase letters (*a* and *g* were printed twice in two different fonts), and hence the maximum possible score was 54. If the children gave the name or the sound of the letter in either Spanish or in English, it was counted as correct.

**Spanish word recognition.** For this test, a list of 15 common Spanish words was compiled from Spanish basal reading series and simple storybooks and used to assess how much the children could already read in Spanish. The experimenter read the practice word at the top of the list and asked the children to read the remaining 15 words. The children read the words at their own pace and skipped any they could not read. One point was given for every word read correctly.

**English word recognition.** Clay's (1979) Ready-to-Read Word test (List C) consisting of 15 common English words was used to assess how much the children could already read in English. The procedure and scoring were identical to those for the Spanish word list.

**Phonemic awareness test.** This test consisted of segmenting, blending, and matching tasks. All instructions, materials, and examples were in Spanish. The score on each of the tests was the number of correct responses. The experimental trials for each task were preceded by 2-3 practice trials during which the experimenter ensured that the child understood the task. On the practice trials, the experimenter gave feedback on the correctness of a child's response. When there was no response or an incorrect response, the experimenter gave the correct answer and explained it before giving another practice item. On the experimental trials, there was no feedback as to the correctness of a response. Care was taken to ensure that the materials were common Spanish words that the children would encounter in everyday life or in books.

Spanish has a better-defined syllabic structure as well as a more regular orthography than English (de Manrique & Graminga, 1984). Consequently, beginning reading instruction in Spanish frequently exploits the consistency of orthography (Goyen, 1989) and the saliency of syllables. In the Spanish basal readers used in the two schools in our study, syllables were an important unit of analysis. Therefore, in addition to phonemes, we included syllables as units that needed to be manipulated in our segmenting, blending, and matching tests.

In English word recognition, the onset-rime division of a syllable is very salient for both children and adults (Treiman, 1985). In fact, some authors claim that it is a salient unit in many languages (for a review see Treiman, 1988). The rime is the obligatory part of the syllable consisting of a vowel and the consonants that follow it. The onset is any consonants that may precede the vowel. For example, the

word *tag* consists of the onset *t-* and the rime *-ag*. Because of their relative accessibility, rime-based families (e.g., the *-ag* family: *bag, drag, tag, brag* or the *-ell* family: *bell, sell, tell, fell*) are suggested as units of focus in beginning reading instruction (Adams, 1990; Goswami & Bryant, 1990). Although we do not know if the onset-rime division is important in Spanish word recognition, because our focus is on transfer to English word recognition, we also included this unit of analysis in our blending task.

*Segmenting task.* This task assessed the children's ability to divide Spanish words into phonemes, syllables, and onset-rimes. The subjects were told that they would play a game with words and divide words into small parts. The experimenters gave examples as to how a word was to be divided. The segmenting task included the following materials:

1. Eight two-phoneme words (*en, no, el, si, al, le, un, mi*) that were to be divided into their two phonemes (e.g., *en*→*e-n*)

2. Four two-syllable words (*foto, poco, cena, casa*) that were to be segmented into their two syllables (e.g., *foto*→*fo-to*)

3. Eight three-phoneme words (*nos, fin, con, tos, por, sed, luz, sin*) that were to be segmented into their three phonemes (e.g., *nos*→*n-o-s*).

The maximum score was 20 with 1 point for each correct response. However, on the third task, some children segmented a word not into three but rather into two components by an onset-rime division (e.g., *nos*→*n-os*). Half a point was given for such responses. Also, if a child did not use the schwa sound, but rather used the vowel in the word to isolate the initial consonant, full credit was given (e.g., *nos*→*no-o-s*).

*Blending task.* The purpose of this test was to determine children's ability to blend isolated sounds into words. In this task, subjects were given parts of words by the experimenter and asked to say the complete word. The component sounds of each word were spoken at approximately half-second intervals. The blending task included the following materials:

1. Six two-phoneme words (*ni, lo, se, te, la, fe*) given as two phonemes (e.g., *n-i*)

2. Six three- or four-phoneme words (*doce, cosa, era, nada, pelo, usa*) given as two intact syllables (e.g., *do-ce*)

3. Six three-phoneme words (*don, mar, mas, pan, del, sal*) given as an onset and rime unit (e.g., *d-on*)

4. Eight three- or four-phoneme words (*pez, sol, les, dos, mesa, una, oso, pala*) given as three or four phonemes (e.g., *p-e-z, m-e-s-a*).

The maximum score on this test was 26 with 1 point for each correct response. No partial credit was given.

*Matching task*. The purpose of this task was to determine children's ability to match the sounds at the beginning of words. Each trial had a target word followed by three alternatives. The subjects were instructed to listen to the beginning sound(s) of the target word and choose one of the alternatives that began with the same sound(s) as the target word. The correct alternative could occur in any of the three positions. In this task, we have included both one and two common phonemes in our matching task because younger children seem to have difficulty in comparing words with one common initial

phoneme. If there are several overlapping phonemes, comparison is easier (Walley, Smith & Jusczyk, 1986). In addition, we controlled for whether the syllable was kept intact or split in the correct alternative when the critical phoneme(s) were isolated. The matching task included the following components:

1. Six target words matched in terms of the initial phoneme in a broken syllable (e.g., target word: ganas, alternatives: gota luna bota).

2. Eight target words matched in terms of the initial two phonemes in an intact syllable (e.g., target word: capa, alternatives: leche caro agua)

3. Six target words matched in terms of the initial two sounds in a broken syllable (e.g., target word: bota, alternatives: curva parte bolsa).

The complete set of materials is given in the Appendix. The maximum score on this test was 20 with 1 point for each correct response. No partial credit was given.

**Spanish and English pre-LAS tests.** To get a measure of proficiency in Spanish and in English, preLAS tests (Duncan & De Avila, 1986) were used. The Spanish and English versions of this test are not translations of each other, but they have identical formats and administration procedures. Each test consists of six subtests. In the first subtest, listening comprehension is evaluated by asking children to act out the instructions given by the experimenter in a "Simon says" game. The second subtest assesses vocabulary by asking children to name the common objects in the drawing of a house. The third subtest again evaluates listening comprehension by asking children to select the picture that best describes a phrase read by the experimenter. The fourth, fifth, and sixth subtests assess language comprehension and production by asking children to repeat phrases, to complete phrases, and to retell two stories.

Pre-LAS tests are recommended for children 4-6 years-old, and the LAS I test is recommended for children in Grades 2-12. Because some of our subjects fell between the two recommended age groups, we decided to use pre-LAS tests at the risk of overestimating our subjects' oral language proficiency in both English and Spanish. Also, in LAS I, instead of the "Simon says" listening comprehension task, a minimal sounds task is found. The minimal sounds task requires subjects to compare pairs of words differing by a phoneme. Because we already had several phonemic awareness tasks, pre-LAS test with its additional listening comprehension test was more useful for our purposes. The remaining tests on pre-LAS and LAS I tests were similar. Although the final score on each test is used to determine the proficiency level of a child ranging from 1 to 5, we have used the total score on these tests rather than the proficiency level to have a finer grained measurement in our data analyses.

**Transfer tests.** Two tests of English reading were used to assess the extent the students' performance in Spanish would transfer to English word recognition. Instructions for these tests were given in English.

*Pseudoword reading.* In this test, eight English-like pseudowords were used. Pseudowords were used to get a relatively "pure" measure of how a word was decoded without any confounding of sight word familiarity. Four of the pseudowords had letters that were pronounced somewhat similarly in Spanish (*tep, poy, sor, fen*) and four of the pseudowords had letters that were pronounced differently in Spanish (*sig, nat, max, fub*). Before the training part of the study, the experimenter said each pseudoword and asked the subjects to segment each pseudoword as an onset-rime unit (*t-ep* or *m-ax*). If the subjects could not segment a word, the experimenter helped them. Following this initial familiarization with the sounds of the pseudowords, the experimenters used a teach-test procedure to determine how easily the children could learn to read these pseudowords from cards, similar to the procedure used by Yopp

(1988). The children were shown each pseudoword written on an index card and taught how to read it by sounding and blending. The experimenters pointed to each onset and rime unit of the pseudoword as they said it and then blended the two units. This process was repeated for four random pseudowords. After this set of four items was taught, the experimenters shuffled the cards and asked the children to try to read the pseudowords themselves. If a child could read all four items, the teaching of the remaining four pseudowords started. If a child missed some of the items, there was another teaching trial with sounding and blending of onsets and rimes, followed by another test trial. This teach-test procedure continued for a maximum of five trials. To score both the rate and the accuracy of pseudoword reading, each of the five trials was given a weight. The first trial was worth 5 points, second trial 4 points and so on. The number of correctly read items on each trial was multiplied by the corresponding weight to get a score. A child who read all four items on the first trial had a score of 60 (5x4 + 4x4 + 3x4 + 2x4 + 1x4), consequently, the maximum possible score on this test was 120 across the two sets of four items.

*Word reading*. For this test, six words were created by combining the onset-rime sounds of the pseudowords studied previously (*toy, fax, pen, sat, for, pig*) and typed on index cards. The experimenters went through the whole deck of cards once, sounding out and blending the words. Then they shuffled the cards and gave them to the children to read. This test consisted of only one trial and involved no reteaching. The maximum possible score was 6.

## Results

Unless otherwise specified, all significant effects are at least at the .05 level. The reliabilities of the phonemic awareness tests were determined by Cronbach's alpha. The reliability analyses were performed on the data from 34 subjects (see footnote 1). In general, the alpha coefficients of all three phonemic awareness tests were quite high: segmenting task = .93; blending task = .95 and matching task = .84.

Table 1 presents the descriptive data on all the measures for the 28 subjects. As expected, our subjects were more proficient in Spanish than in English. Their Spanish pre-LAS scores were higher than their English pre-LAS scores, $t(27) = 1.86$, and they could read more words in Spanish than in English, $t(27) = 8.02$. On the average, our subjects could identify 80% of the letters. The mean performance on the phonemic awareness tests ranged from 58% for the segmenting test to 65% for the blending test and to 74% on the matching test.

**[Insert Table 1 about here]**

The correlations between measures are presented in Table 2. As Columns 3 and 4 show, the three Spanish phonemic awareness tests were highly interrelated, with correlations ranging from .54 between blending and matching tests to .73 between segmenting and blending tests. This finding replicates the high correlations reported between different English phonemic awareness tests (Stanovich et al., 1984; Stuart & Coltheart, 1988; Yopp, 1988). Because the three tests are closely interrelated, and they seem to be tapping a single underlying construct (Stanovich et al., 1984), the total score on the three phonemic awareness tests was used as a single measure of phonemic awareness in the following analyses. The total phonemic awareness score (Row 5) was significantly correlated with the number of Spanish words read ($r = .64$) and with the number of English words read ($r = .59$). More importantly, the phonemic awareness score was highly correlated with performance on the two transfer tests, pseudoword reading and word reading, $r = .73$ and $r = .84$, respectively. In contrast, neither Spanish nor English oral proficiency scores had significant correlations with performance on the transfer tests. (All correlations ranged from .06 to -.15.) More interestingly, Spanish oral proficiency had no relationship to Spanish

word reading ($r$ = -.06). Likewise, English oral proficiency did not correlate with English word reading ($r$ = .03). The two transfer measures were correlated ($r$ = .87) indicating that decoding skill as determined by pseudoword reading is closely related to reading of real words for beginning readers (Stanovich, 1982, 1986; Tunmer et al., 1988).

**[Insert Table 2 about here]**

Because we had five kindergarteners in our sample, we have also included grade as a variable in the analyses. Grade had relatively small correlations with phonemic awareness score ($r$ = .41), and the two transfer measures, pseudoword reading ($r$ = .50) and word reading ($r$ = .40). Its biggest correlation was with Spanish word reading ($r$ = .68) which is not surprising considering that Spanish reading instruction starts in the first grade.

To isolate the variables affecting performance on the transfer tests, we performed multiple regression analyses using word reading and pseudoword reading as the dependent variables. The results are presented in Table 3. The seven independent variables in the equation (Spanish and English oral proficiency, grade, letter identification, English and Spanish word recognition and total phonemic awareness score) altogether explained 74.5% of the total variance for pseudoword reading, $F(7,20)$ = 8.34, and 85.7% of the variance for word reading, $F(7,20)$ = 17.07. However, in the final equation for pseudoword reading transfer test, only two variables had significant beta weights, Spanish word recognition and phonemic awareness. For word reading transfer test, grade, Spanish word recognition and phonemic awareness were significant[2].

**[Insert Table 3 about here]**

These results indicated that Spanish word recognition and Spanish phonemic awareness were better predictors of performance on English pseudoword and word reading tests than English or Spanish oral proficiency or English word recognition. However, because Spanish word recognition and phonemic awareness are significantly correlated ($r$ = .64), they may have overlapping influences on transfer test performance. To address this question, we have carried out hierarchical regression analyses entering the two variables in two different orders to determine if one variable explains a unique amount of variance when the other one is accounted for in the regression equation.

In these analyses performance on transfer tests was regressed on grade, followed by either Spanish word recognition or phonemic awareness scores. The results are presented in Table 4. First, with only three variables, 72% of the variance for pseudoword reading, $F(3,24)$ = 20.57, and 83.7% of the variance for word reading, $F(3,24)$ = 41.17, could be explained. As summarized in Table 4, grade explained 25% of the variance for pseudoword reading and 16.3% of the variance for word reading. More importantly, both Spanish word recognition and phonemic awareness scores had independent contributions to explain the total variance. In Order 1, after both grade and Spanish word recognition were entered, phonemic awareness still explained a significant 7.7% of the variance ($F$-change = 6.59) for pseudoword reading and a significant 18.8% of the variance ($F$-change = 27.66) for word reading.

**[Insert Table 4 about here]**

When the variables were entered in Order 2, that is, grade and phonemic awareness followed by Spanish word recognition, the last variable still explained a significant 14% of the variance ($F$-change = 11.98) for pseudoword reading and a significant 12.4% of the variance ($F$-change = 18.28) for word reading.

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The final equation for both orders indicated that only Spanish word recognition and phonemic awareness scores had significant beta weights for both of the transfer measures, and grade was not significant. To doublecheck that grade was not a critical variable, we performed another multiple regression analysis (Order 3 in Table 4). In this analysis, grade was entered last into the equation after phonemic awareness and Spanish word recognition. Once the first two variables were in the equation, grade explained only an additional nonsignificant 0.2% of the variance for pseudoword reading and 2.5% of the variance for word reading. Hence our results indicate that the best predictors of performance on English pseudoword and word recognition tests are Spanish phonemic awareness and Spanish word recognition. More interestingly, neither English or Spanish oral proficiency nor grade are good predictors. If only phonemic awareness and Spanish word recognition are entered into a multiple regression equation, 71.8% of the variance for pseudoword reading, $F(2,25) = 31.89$, and 81.3% of the variance for word reading, $F(2,25) = 54.18$, are explained. Comparing this result with the total variance explained with seven variables (72.0% and 83.7% of the variance for pseudoword and word reading tests, respectively) indicates that the predictive power of just these two variables is far from trivial.

A scatterplot of the relationship between phonemic awareness and pseudoword reading revealed a linear pattern. Of the 17 children who scored above the group mean (43.5) in phonemic awareness tests, 15 also scored above the group mean (80.5) on pseudoword reading. Only two children had high phonemic awareness scores but performed below the group mean on the pseudoword reading test. In contrast, of the 11 children performing poorly on the phonemic awareness tests, 9 also performed poorly on the pseudoword reading test. This latter result is similar to the pattern reported by several researchers (Juel et al., 1986; Tunmer & Nesdale, 1985; Tunmer et al., 1988) in their studies with monolingual children. They also found that there were few or no children who performed poorly on phonemic segmentation, but well on pseudoword decoding. In our experiment, we have shown a similar effect across languages, indicating cross-language transfer of phonemic awareness.

## General Discussion

We will organize the discussion of our results around the two main issues described in the introduction: (a) cross-language transfer of phonemic awareness and (b) the role of oral language proficiency in second-language word recognition.

### Cross-Language Transfer

Research with monolingual beginning readers has convincingly demonstrated the relationship between phonemic awareness and reading acquisition. In this study, we have replicated this finding with Spanish-speaking children and have shown that phonemic awareness in Spanish is closely related to Spanish word recognition. We have also replicated the finding that phonemic awareness tests such as segmenting and blending are closely interrelated. Another monolingual finding that was replicated in our study was the close relationship between pseudoword and word recognition for beginning readers, reflecting the importance of word attack skills in beginning reading. However, the critical finding in our study is the cross-language transfer of phonemic awareness. We have demonstrated the relationship between phonemic awareness in Spanish and word recognition in English. Children who could perform well on Spanish phonemic awareness tests were more likely to be able to read English words and English-like pseudowords than children who performed poorly on phonemic awareness tests. In short, phonemic awareness was a significant predictor of performance on word recognition tests both within- and across-languages.

Phonemic awareness, like other metalinguistic abilities, requires one to reflect on and manipulate the structural features of the spoken language (Tunmer et al., 1988). Unless a child can deliberately focus

on the form rather than on the content of a word, the phonemes in a word are not readily transparent. For example, a child saying *cat* is normally more interested in its meaning rather than in its structural components. However, once a child is able to reflect on the components of a language, it is likely that this metalinguistic awareness could be applied to an (alphabetic) second language as well.

Another cross-language transfer observed in our study was the interrelationship between Spanish word recognition and performance on English transfer tests. Children who could read more words in Spanish were more likely to perform well on the transfer tests. More interestingly, performance on English transfer tests were better predicted by the Spanish word list test than the English word list test. One possible explanation for this pattern is that children knew how to use spelling-to-sound correspondences to recognize words in Spanish because they had received explicit instruction on this skill. Children who could read the Spanish words could transfer this skill to figuring out how to read the pseudowords. In contrast, the common English words in the list could have been recognized by sight or by decoding. These mixed strategies did not have as strong a predictive power as performance on Spanish word list test.

Just as phonemic awareness facilitates word recognition, schooling and learning to read can also facilitate phonemic awareness. Because most of our subjects were already reading quite a few words in Spanish, we cannot address this question of directionality. However, regardless of the direction, both phonemic awareness and word recognition in Spanish seem to transfer and predict word recognition performance in English. Although the two variables have some overlap, both contribute independently to performance on English word and pseudoword recognition.

The pattern of cross-language transfer summarized above indicates that it is possible to build upon the strengths a child already has in his or her first language. A child who already knows how to read in Spanish and who has a high level of phonemic awareness in Spanish is more likely to perform well on English word and pseudoword recognition tests. In the usually-heated controversy on bilingual education, there are several different rationales given for instructing children in their first language initially. For example, learning to read in a language already spoken at home causes less confusion (Cummins, 1981; Downing, 1986). Also, the cultural and linguistic identity of students from non-English backgrounds can be maintained. Our research provides another rationale, namely that learning to read in the first language can be useful because some of the skills and knowledge can transfer and facilitate reading in English.

## Oral Language Proficiency

One of the most common criteria used for entering and exiting students to and from bilingual education programs is English oral proficiency. In fact, a survey found that 92-94% of school districts used English oral proficiency (alone or in conjunction with other measures) to make entry/exit decisions (Fradd, 1987). Likewise, the schools in our study made placement decisions using both English oral proficiency and staff judgments. Our data support the caution expressed by several researchers (e.g., Moll & Diaz, 1985; Saville-Troike, 1984) that oral proficiency by itself is not a very reliable predictor of reading abilities. Performance on our oral proficiency tests did not have any significant correlations with word recognition or phonemic awareness measures.

Of course, we were focusing on a very specific component of the reading process. Although word recognition is a crucial component of the reading process, it is not the only component. If we had focused on other components of the reading process or on other reading levels, oral proficiency may have played a more prominent role. For example, Verhoeven (1990) found that oral proficiency of Turkish children in Dutch (as measured by syntax and vocabulary knowledge) showed a higher

correlation with Dutch reading comprehension than with word recognition measures. Likewise, if we had focused on other levels or other components of the reading process cross-language transfer effects could have been nonsignificant. We do not see this as a weakness but rather as a strength of our approach. We will discuss this point further in the next section.

## Studying Cross-Language Transfer

Cross-language transfer needs to be investigated under well-specified conditions with well-specified tasks. The question is not whether cross-language transfer occurs or whether oral language proficiency is a good predictor of reading performance. Rather the question is one of condition-seeking (McLaughlin, 1987): Under what conditions and which components of the reading process reflect cross-language transfer? Under what conditions and for which components of reading is oral proficiency a good predictor? Our results indicate that during word recognition process, cross-language transfer can occur. Both phonemic awareness and word recognition skills in Spanish are predictive of word recognition in English. In contrast, oral language proficiency in Spanish is not related to word recognition processes in English. Further research can elucidate which other skills and knowledge in a reader's first language affect certain components of the reading process in a second language.

Methodologically another point needs to be highlighted. In our study we have not compared the performance of bilinguals with monolinguals, but rather processing in the two languages of a bilingual were analyzed (cf. Hakuta, Ferdman, & Diaz, 1987). What a child could do on specific tasks in the first language was used to predict what that child could do on specific tasks in the second language. However, to use this analytic, component skills approach (cf. Haynes & Carr, 1990), a good model describing the interrelationship of the two sets of tasks is necessary. Monolingual reading research had provided us with a well-supported model demonstrating the relationship between phonemic awareness and word recognition in beginning reading that we have utilized to investigate cross-language transfer. The exciting new developments in the reading research are beginning to reveal more relationships between different components of the reading process that can be applied to research on bilingual reading.

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## Footnotes

[1]Two of the dropped subjects had complete data in their phonemic awareness tests. Those subjects' data were included in the reliability analyses of the phonemic awareness tests. In addition, phonemic awareness test data from four pilot subjects from another school district were also included in the reliability analyses.

[2]We have also analyzed the data from only the first graders using all six variables. The pattern of the results was identical. No variable other than Spanish word recognition and phonemic awareness scores had significant beta weights in the final equation and 66% and 81% of the variance was explained for pseudoword reading and word reading transfer tests, respectively.

**Table 1**

**Means, standard deviations, and maximum possible scores of measures**

| | Mean | sd | Max. Score |
|---|---|---|---|
| Letter identification | 43.32 | 9.14 | 54 |
| Spanish word recognition | 10.21 | 5.34 | 15 |
| English word recognition | 3.29 | 3.51 | 15 |
| Segmenting score | 11.68 | 5.16 | 20 |
| Blending score | 17.00 | 7.26 | 26 |
| Matching score | 14.89 | 4.64 | 20 |
| Total phonemic awareness | 43.57 | 14.49 | 66 |
| Spanish pre-LAS score | 81.68 | 21.22 | 100 |
| English pre-LAS score | 70.50 | 22.83 | 100 |
| Transfer test: pseudoword | 80.50 | 41.13 | 120 |
| Transfer test: word | 3.82 | 2.37 | 6 |

**Table 2**

**Intercorrelations of all variables**

| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) GRADE | 1.00 | .45* | .30 | .36* | .41* | .05 | .68* | .23 | .33* | -.25 | .50* | .40* |
| (2) SEGMENT | -- | -- | .73* | .67* | .91* | .27 | .71* | .53* | -.21 | -.01 | .74* | .79* |
| (3) BLEND | -- | -- | -- | .54* | .91* | .31 | .51* | .58* | -.24 | .04 | .62* | .72* |
| (4) MATCH | -- | -- | -- | -- | .79* | .19 | .47* | .38* | -.26 | .36* | .55* | .72* |
| (5) PHONAW | -- | -- | -- | -- | -- | .31 | .64* | .59* | -.26 | .11 | .73* | .84* |
| (6) LETTER | -- | -- | -- | -- | -- | -- | .32* | .36* | -.23 | .15 | .30 | .29 |
| (7) SPANW | -- | -- | -- | -- | -- | -- | -- | .53* | -.06 | -.13 | .80* | .79* |
| (8) ENGW | -- | -- | -- | -- | -- | -- | -- | -- | .05 | .03 | .60* | .63* |
| (9) SPANLAS | -- | -- | -- | -- | -- | -- | -- | -- | -- | -.05 | -.04 | -.15 |
| (10) ENGLAS | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -.04 | .06 |
| (11) PSEUD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | .87* |
| (12) WORD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

*Note.* * $p < .05$. SEGMENT = Segmenting score; BLEND = Blending score; MATCH = Matching score; PHONAW = Total phonemic awareness score; LETTER = Letter identification; SPANW = Spanish word recognition; ENGW = English word recognition; SPANLAS = Total score on Spanish pre-LAS test; ENGLAS = Total score on English pre-LAS test; PSEUD = score on pseudoword reading test; WORD = score on word reading test.

**Table 3**

**Regression analyses on pseudoword (PSEUD) and word (WORD) reading transfer measures**

TRANSFER TEST: WORD

| | beta | t | | |
|---|---|---|---|---|
| 1. SPANLAS | .141 | 1.183 | | |
| 2. ENGLAS | .003 | .033 | | |
| 3. SPANW | .619 | 3.969* | | |
| 4. LETTER | -.054 | -.564 | | |
| 5. PHONAW | .611 | 4.305* | | |
| 6. ENGW | .033 | .259 | | |
| 7. GRADE | .317 | 2.053$^a$ | | |
| | R = .926 | $R^2$ = .857 | F(7,20) = 17.07* | |

TRANSFER TEST: PSEUDOWORD

| | beta | t | | |
|---|---|---|---|---|
| 1. SPANLAS | .159 | 1.004 | | |
| 2. ENGLAS | -.050 | -.396 | | |
| 3. SPANW | .611 | 2.939* | | |
| 4. LETTER | .012 | .095 | | |
| 5. PHONAW | .407 | 2.150* | | |
| 6. ENGW | .065 | .388 | | |
| 7. GRADE | .158 | .766 | | |
| | R = .863 | $R^2$ = .745 | F(7,20) = 8.31* | |

*Note*: See Table 2 for an explanation of variable names, $^a p < .06$; $^* p < .05$

**Table 4**

**Regression analyses on pseudoword (PSEUD) and word (WORD) reading transfer measures**

| | PSEUD | | WORD | |
|---|---|---|---|---|
| Order 1 | R | increase in $R^2$ | R | increase in $R^2$ |
| GRADE | .50 | .25* | .40 | .16* |
| SPANW | .80 | .39* | .81 | .49* |
| PHONAW | .85 | .08* | .92 | .19* |
| Order 2 | | | | |
| GRADE | .50 | .25* | .40 | .16* |
| PHONAW | .76 | .33* | .84 | .55* |
| SPANW | .85 | .14* | .91 | .12* |
| Order 3 | | | | |
| PHONAW | .73 | .53* | .84 | .71* |
| SPANW | .85 | .19* | .90 | .10* |
| GRADE | .85 | .00 | .92 | .02 |

*Note*: See Table 2 for an explanation of variable names, *$p < .05$

## Appendix

Words in the Matching Test

| TARGET WORD | ALTERNATIVES | | |
|---|---|---|---|
| Initial sounds the same, broken syllable | | | |
| ganas | luna | gota | bota |
| nene | base | nota | cana |
| coche | carta | dedo | misa |
| mono | lapiz | tiza | madre |
| toro | malo | arte | tela |
| pera | pino | risa | arbol |
| Initial two sounds the same, intact syllable | | | |
| capa | leche | caro | agua |
| sapo | sala | yoyo | curso |
| lata | pico | zero | lado |
| boca | casa | torre | bota |
| arte | isla | once | arpa |
| base | lobo | baja | pero |
| mural | mujer | noche | poder |
| vaso | loma | vaca | dulce |
| Initial two sounds the same, broken syllable | | | |
| cono | corte | rampa | lindo |
| lava | gusto | mundo | largo |
| bota | curva | bolsa | parte |
| todo | torta | campo | busca |
| pato | mares | color | parque |
| fino | gana | finca | donde |